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Marchionni, Caterina

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Chapter 32. Mechanisms in Economics

Caterina Marchionniⁱ

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I. Introduction

The market represents the paradigmatic example of an economic mechanism. Adam Smith famously theorized it as functioning as if led by an invisible hand so as to satisfy the needs of market participants. Over the years the market has been variously theorized as a mechanism *for* resource allocation, price discovery, assignment of property rights and many other things besides (cf. Rosenbaum, 2000; Mirowski, 2007). At the same time, it has also come to be treated more and more abstractedly and transported far from the economic domain to become a mechanism *for* phenomena as diverse as mating behavior in animals, competition between churches, and marriage choices – instances of a wider trend known as *economics imperialism* (Mäki, 2009a). In spite of the centrality of the market mechanism, however, economics is not solely concerned with market-related phenomena. In fact, a recurring theme of this chapter will be that economics is distinct from the other social sciences not so much by virtue of the kind of real-world mechanisms (and phenomena) with which it deals, but because of the way in which mechanisms are identified and analyzed. What I hope to highlight is the role that economists' methodological commitments play in defining what counts as a mechanism in economics.

In economics the term *mechanism* has various uses. Julian Reiss (2013, p. 104-105) identifies four different notions. The first is the econometricians' notion of

mechanisms as individual causal relations. The contrast here is with mere correlation. The second refers to variables that intervene between a cause and an effect and, as Reiss observes, it is often used in the context of causal inference. The third takes mechanisms to be underlying structures or processes (for example, the market), while the fourth takes mechanisms to be pieces of theory (for example, a theoretical hypothesis showing the conditions under which the market clears). It is mainly the last two notions, to which I will simply refer as mechanisms as underlying structures, that come the closest to the conception of mechanisms advanced by current mechanistic philosophers. It is also the one with which I will be mainly concerned in this chapter, even though, as we will see, the notions of mechanisms as underlying structures and as intervening variables are not always kept clearly separate in philosophical discussions about causal inference and extrapolation (cf. Kincaid, 2004).

Mechanisms have been prominent in recent philosophical reflections on economics: they have been claimed to provide justification for methodological individualism, to be necessary for causal inference and to aid extrapolation of causal claims from one context to another. In what follows, after giving a characterization of how mechanisms are conceived and represented in economics (Sections II and III), I discuss the alleged connection between mechanism and methodological individualism (Section IV), the role of mechanisms in causal inference from statistical data and extrapolation (Sections V and VI). Section VII offers some concluding remarks.

II. What is a mechanism in economics?

Let us begin with a minimal definition proposed as a way of capturing the basic features of mechanisms that contemporary mechanistic philosophers would agree on and that I take to characterize also what Reiss calls *mechanisms as underlying*

structures.

[M] A mechanism for a phenomenon consists of entities and activities organized in such a way that they are responsible for the phenomenon (Illari and Williamson 2012, p.120; see also Chapter 1 and Glennan, n.d.).

Further features can be added to [M] to produce more specific accounts that restrict the scope of what kinds of things qualify as mechanisms. There are two ways in which [M] can be augmented to take into account the specificities of economics. The first concerns the *kind of mechanism* economics deals with, whereas the second concerns *how* economists identify and analyze mechanisms.

Dan Steel defines *social mechanisms* as follows:

[SM] Social mechanisms are complexes of interacting individuals, usually classified into specific social categories, that generate causal relationships between aggregate-level variables (Steel, 2004, p. 59).

Compared to [M], [SM] involves individuals as component parts, individuals that are typically classified into social categories, such as buyers and sellers, fathers and daughters, and who engage in certain kinds of activities (such as buying and selling, providing a dowry and marrying) by virtue of the social roles they occupy. Starting from [SM], which is arguably a general description including economic mechanisms as a subset, one obvious way to single out economic mechanisms is by virtue of their being about particular kinds of social roles, namely those pertaining to the market, or the economy more generally. This is, however, at most only a tiny part of the story. Not only is economics concerned with phenomena that do not clearly pertain to the economy, but the other social sciences are also interested in (say) markets and market-related phenomena.

Another way of reformulating [SM] so as to take into account the specificity of economics is to include the *type of assumptions* economists make about the behavior of individuals, namely those assumptions that derive from economists' commitment to rational-choice theory.ⁱⁱ Although sometimes rational-choice theory is interpreted as being concerned exclusively with individuals and their properties, however, it often presupposes structural and institutional facts, and its 'individuals' can also be firms, households, or organizations (see, for example, Kincaid, 1996; Janssen, 1993). To capture the latter feature, let us replace *individuals* with *rational agents* in [SM]. This gives us the following characterization of mechanisms in economics:

[EM] Mechanisms in economics are complexes of rational agents, usually classified into social categories, whose actions and interactions generate causal relationships between aggregate-level variables.

[EM] defines mechanisms on the basis of the kind of entities that compose them, namely agents, *and* the kind of properties ascribed to them, namely rational behavior. This is a descriptive (not a normative) claim about what economists (typically) take mechanisms to be and does not entail that this is what economic mechanisms really are. In what follows [EM] will be unpacked and related to some of the main debates concerning mechanisms in economics.

III. Theoretical modeling of mechanisms

What distinguishes economics from other social sciences is not only the kind of mechanisms economics deals in but also the way in which these mechanisms are studied. That is, mainly by building and analyzing simple models of mechanisms described at a high level of abstraction. This characteristic is captured by some of the most prominent accounts of models in economics. The connection between theoretical

models and mechanisms features in Mäki's account, according to which economic models are means to isolate the operation of a mechanism from the interference of other factors (see, for example, Mäki 1992, 2009b).ⁱⁱⁱ Similarly, Cartwright (2001, see also her 1989) claims that economic models are “blueprints for socio-economic machines”: by theoretical means models create the right conditions for mechanisms to operate unimpeded. Such conditions do not typically occur spontaneously in the real world, implying that the disturbing factors that in the models were isolated away will affect the mechanism's operation. Of course, not all economic models aim at representing mechanisms; some are better thought of as “phenomenological” models (see Chapter 17). Moreover, those models that can be conceptualized as isolating mechanisms might not succeed in actually representing any real-world mechanism.

In their modeling of mechanisms, economists also subscribe to a set of theoretical commitments and desiderata, which contributes to setting the modeling approach of economics apart from that of other sciences (Marchionni, 2013). First, the *mechanistic requirement* holds that the phenomenon to be explained should be shown to result from a mechanism that fits [EM] above. The legitimacy of the mechanistic requirement will be the topic of the next section. In particular, we will see that different interpretations of this requirement have different degrees of plausibility. A second desideratum economists emphasize relates to unification and requires that the mechanism be derived from a unifying theory, that is, rational-choice theory. Economists' commitment to rational-choice theory has been harshly criticized: rational-choice theory has been found to be either empirically wanting, at least as a theory of individual behavior, or empirically vacuous. Its credentials as a unifying theory are also suspicious. As Reiss (2013) points out, its flexibility rather than its content account for its unifying power. This brings us to the third desideratum that

holds that other things being equal it is a good thing that the same kind of mechanism is shown to account for many phenomena. Since scope is typically a positive function of the level of abstraction at which a mechanism is described, the desideratum of generality leads to a preference for abstract descriptions of mechanisms.

Consider, for example, the application of Hotelling's model – in which firms choose where to locate spatially in order to maximize their market shares – to political parties choosing where to locate themselves in the political space in order to maximize the number of votes (Kuorikoski, 2009; see also Reiss, 2013). The main result of Hotelling's model of spatial localization, according to which firms will tend to locate close to one another, is also shown to account for the fact that political parties tend towards the center of the political spectrum. It is the abstract “logic of the situation” that is hypothesized to be similar, and hence to account for the similarity between the economic and political phenomenon (Kuorikoski, 2009).^{iv} This conception of mechanisms is compatible with the characterization of mechanisms in economics [EM], which in turn is compatible with the minimal definition [M]: in Hotelling's model, the components are the firms (or the political parties), who by virtue of their socio-economic roles, perform activities that in interaction bring about the phenomenon to be explained.

The ease with which abstract descriptions of mechanisms can be transferred across domains has drawbacks (Kuorikoski, 2009). Very little might be inferred about the political market for votes on the basis of the set of features it shares in common with standard markets, while at the same time relevant features specific to each domain might be unduly ignored. Furthermore, the similarity between “situations” does not automatically warrant inferences about properties of the agents across domains. For example, if the assumption of maximizing behavior might be justified

by the selection pressures the market exerts on firms, it is not necessarily the case that such behavior is legitimately attributed to political parties if similar selection pressures are absent or are counteracted by other institutional mechanisms. Finally, the strategy of building simple models of abstract mechanisms is likely to pose limits on the kind of phenomena economists would succeed in explaining. For some this is not a far-fetched possibility (see, for example, Lawson, 1997; Northcott and Alexandrova, 2015).

IV. Methodological individualism

Economists' commitment to the doctrine of methodological individualism emerges with particular clarity from the belief that macroeconomics should be built on microeconomic foundations (Janssen, 1993; Hoover, 2001). The philosophical debate on micro foundations and methodological individualism has mainly concerned whether *individual-level mechanisms* are necessary for economic explanation and/or whether explanations that do include individual-level mechanisms are somehow better than purely macro-level explanations (Kincaid, 1996). To make the discussion more concrete, let us use a stylized example originally presented in Jackson and Pettit (1992), which I also discuss in Marchionni (2008).

Suppose that the phenomenon to be explained is an increase in the crime rate in a particular neighborhood. Such an increase can be explained in two ways. An aggregate-level explanation identifies a recent increase in the level of unemployment as the cause of the increase in crime rate. An individual-level explanation instead would describe the changes in the opportunities and motivations of particular individuals. As a thesis about explanation, methodological individualism would hold either that the aggregate-level explanation alone does not explain or that in any case the individual-level explanation is better.

There is a sense in which the explanation is deficient. What is missing from the explanation is a description of the mechanism relating crime and unemployment. But does such a mechanism always need to be at the individual level? Harold Kincaid (1996) has offered both conceptual and empirical arguments against the claim that individual-level mechanisms are necessary for explanation. In its strongest version, methodological individualism holds that underlying mechanisms must only cite individuals and their properties. This is a non-starter, however: as mentioned above, rational-choice theory, the allegedly individualist theory par excellence, is not concerned only with individual behavior and often presupposes social kinds (Janssen, 1993; Kincaid, 1996).

A weaker version of the argument linking methodological individualism, mechanism and explanation takes it that individual-level explanations are somehow *better*. This idea, too, has been disputed. Compared to an aggregate-level explanation, the individual-level one, describing the changes in opportunities and motivations of particular individuals, misses relevant information, namely that irrespective of the behavior of particular individuals, an increase in unemployment would have brought about an increase in the crime rate (Jackson and Pettit 1992; Garfinkel, 1981; see also Kincaid 1996). These arguments show that neither an exclusively individual-level explanation nor an exclusively aggregate-level one is always to be preferred.^v

Finally, an even weaker version of methodological individualism takes it that the comparison should not be between an explanation that simply relates the level of unemployment and the crime rate and one that only cites individuals, their motivations and actions (Coleman, 1990; Janssen, 1993, Chapter 31). Instead, the issue is whether the aggregate-level explanation is improved by showing how an increase in the level of unemployment affects individuals and how this in turn causes

the crime rate to increase. For example, suppose now that the direction of causality goes from crime rate to unemployment level and that the agents' choice of whether to engage in criminal activities as well as their opportunity to find a job is affected by the social network in which they interact (Granovetter, 1973). In particular, suppose that agents are more likely to engage in criminal activities the more people around them do so, and are more likely to find jobs the more people around them are actually employed. It follows that an increase in the crime rate in a particular neighborhood makes it more likely for an individual to interact with a criminal than with someone who is employed and can provide information about new jobs (Calvó-Armengol and Zenou, 2003, p.71). This contributes to increase the level of unemployment, which in turn contributes to increasing the crime rate. This is a mechanistic explanation, but the mechanism described is not a purely individual-level one. It describes how an aggregate variable (crime rate) affects another aggregate variable (unemployment level) via micro determinants (individuals' job search) (see Figure 32.1).^{vi}

[Insert figure 32.1 here]

This style of explanation is compatible with current mechanistic approaches to explanation. Although (constitutive) mechanisms are at a lower level than the phenomenon to be explained, levels of mechanisms do not map onto traditional compositional ones characterized by mereological or aggregative relations (Chapter 14; Bechtel and Hamilton, 2007). Instead, “X’s φ -ing is at a lower mechanistic level than S’s ψ -ing if and only if φ -ing is a component in the mechanism for S’s ψ -ing” (Craver, 2007, p.189). This means that philosophical accounts of mechanistic explanation do not require that mechanisms in economics should be at the individual level. For some economic phenomena, the agents interacting in the mechanism can be firms, organizations, whole countries, or even sub personal entities (Kincaid, 2004).

Furthermore, in a mechanistic explanation the level of organization as well as the environment in which mechanisms are embedded are also important— in our example, these are the networks of relations in which one is embedded and the change in the level of unemployment. If economists' mechanistic requirement is interpreted as demanding that economic phenomena be explained by representing the multiple-level mechanisms that bring them about, then such a requirement can be justified along the lines proposed by current mechanistic philosophers.

V. Causal inference

Knowledge of mechanisms has been claimed to play a key role in making causal inferences from statistical data more secure. It has even been suggested that to distinguish genuine causal relations from mere correlations knowledge of mechanisms is *necessary* (Elster, 1983). As an illustration let us return to the crime-unemployment example. The idea is that knowledge of a connecting mechanism between the aggregate-level variables helps to identify whether the two variables are in fact causally connected, and the direction of causality, or are they both effects of a common unmeasured cause. What is under dispute is whether mechanisms are always necessary to identify genuine causal relations in the context of non-experimental research. Note that this claim has two interpretations: the quest for mechanisms can be interpreted as a quest for individual-level mechanisms or for lower-level mechanisms more generally.

Kincaid (1996, pp. 179 -182) advances two objections to the first interpretation of this claim, that is, the necessity of individual-level mechanisms (see also Hoover, 2001; Reiss 2008; Steel 2004). The first is that there is no reason to stop at the level of individuals. If mechanisms are necessary to confirm causal relations, why shouldn't we go down the hierarchy of levels until we reach the rock bottom?

Clearly such regress does not help the claim that individual-level mechanisms are necessary for causal inference in economics.^{vii} The second objection is that causal relationships can be identified with enough confidence through other means such as randomized controlled trials or statistical techniques, and Kincaid offers a few examples of this.

Even if we agree with Kincaid and others that evidence of individual-level mechanisms is not necessary for the confirmation of causal claims, it might still play a useful role. This is the position Steel (2004; 2011) advocates. The key to appreciate how evidence of mechanisms can help causal inference is to distinguish between *direct* and *indirect casual inference* (Steel, 2011). One of Steel's illustrations concerns the postulated causal relationship between the legalization of abortion in 1973 in the US and the decline of the crime rate in the 1990s (Donohue and Levitt, 2001). Information about the micro-level mechanism, from being an unwanted child to criminality, was marshaled as further evidence of the causal link between legalization of abortion and decline of the crime rate. Direct causal inference concerns the causal relationship between legalization of abortion and decline of crime rates, whereas the indirect causal inference concerns the causal relationship between being an unwanted child and criminal behavior. The reason why evidence of the causal relationship between unwanted childhood and criminal behavior is valuable is practical: it concerns the fact that we might be in a position to make a stronger inference about the variables in the mechanism than about the variables in the original relation. In this example, the direct casual inference concerns aggregate variables, whereas the indirect causal inference concerns the individual-level variables, but presumably the same logic applies if the variables in the mechanism were at the same level as those of the primary causal claim. Hence, I agree with Reiss that "...it is not

necessary that the “mediating” variable obtains at a lower level than the original cause and effect variables” (2013, p.104). I suspect the same logic applies more broadly in cases in which a primary causal claim is supported by evidence of different kinds (Claveau, 2012; Staley, 2004). If so, then it is unclear whether the relevant notion of mechanism here involves any form of reduction, not even in the broad sense of underlying or constitutive structures.^{viii}

The strategy of abstraction and simple models discussed above constitutes the most common source of mechanistic hypotheses in economics (see also Reiss, 2008, pp.116-117).^{ix} Assessing the plausibility of these mechanistic hypotheses is ultimately an empirical matter. I agree with Steel that there is not one set of methodologies that uniquely supplies mechanistic evidence, which can be obtained by laboratory and field experimentation, or as in the Donohue and Levitt’s example, by correlational studies. In Donohue and Levitt’s study, evidence in favor of the mechanistic hypothesis also came from studies in countries where for a time abortions had to be approved by the government. In these studies, children born from women who were denied the procedure were found to be more likely to engage in criminal behavior later on. Using such evidence in support of the causal claim about legalization of abortion and decline of criminality in the United States, however, involves a further inferential step – one concerning the relevant similarity between the countries in which the evidence was obtained and the United States. This is known as the problem of extrapolation, to which I now turn.

VI. The problem of extrapolation

The problem of extrapolation concerns how to justify transporting causal claims from one context, for example a laboratory experiment or one country, to another, the real

world or another country. Steel (2008) offers a comprehensive philosophical treatment of mechanism-based extrapolation. Mechanism-based extrapolation crucially involves the deployment of a methodology he calls *comparative process tracing*. The latter is a matter of comparing mechanisms in the model and in the target by focusing on stages where background knowledge tells us there are likely to be causally relevant differences and/or on those downstream stages where upstream differences are likely to have left a mark (see Figure 32.2).

[Insert figure 32.2 here]

Steel is optimistic that comparative process tracing can be used to justify extrapolation in biology, but he is more cautious with regard to economics (and social science more generally) for two reasons. The first is that for mechanism-based extrapolation to work, we need mechanisms that are modular, but policy interventions on some part of a mechanism might turn out to affect the mechanism's overall structure. The second concerns uncertainty about the mechanisms responsible for economic phenomena. Let us consider each problem in turn starting from the latter.

The viability of mechanism-based extrapolation in economics, Steel (2008) argues, is complicated by the uncertainty about the mechanisms responsible for economic phenomena. For example, in spite of sustained and systematic experimental study since its discovery in the 1970s, preference reversal -- "a behavioral tendency for the preference ordering of a pair of alternatives to depend, in a predictable way, on the process used to elicit it" (Starmer, 2008, p.1) -- still lacks a theoretical explanation. Yet, as Guala (2010) observes, uncertainty about the cause of preference reversal only tells us that further work is needed, not that uncertainty is an ineliminable and pervasive feature of economics experiments.

That the effect of policy interventions on causal structure constitutes a problem for economics is captured in the well-known *Lucas critique*, which states that since agents' optimal behavior often changes in response to policy changes, many macroeconomic forecasts, which are based on assumptions about agents' optimal behavior, are bound to fail (Lucas, 1976). In other words, it might be the case that policy interventions on some part of a mechanism affect the mechanism's structure. There are two possible ways of addressing the difficulties posed by such "structure-altering interventions": an experimental and a theoretical one. First, at least in principle it is possible to design an economic experiment in which the intervention would alter the structure in the same way as the policy intervention, if implemented, would. The result of such an experiment could help us overcome the problem of structure-altering interventions and hence deploy mechanism-based extrapolation (Guala, 2010, p.1079). Since large-scale interventions are hard to implement in the laboratory or in the field, and experimenting on a smaller scale would still entail uncertainty about the effect of an implementation on a larger scale, however, Steel's concern with structure-altering interventions remains a practical problem.

The second route, suggested by Steel (2008, p.158), is to rely on a more fundamental theory to tell what kind of changes in causal structure the intervention is likely to produce. At present the most likely candidate in economics for such a theory is rational-choice theory.^x Therefore, the issue turns on the appropriateness of rational-choice theory qua *fundamental* theory. In particular, Steel calls upon recent results in experimental economics, which show that small changes in variables that fall outside the domain of the theory have dramatic effects on behavior, casting doubts about whether rational-choice theory can help in anticipating the consequences of structure-altering interventions.

Steel's last conclusion might be too hasty, however. It can be argued that experimental results concerning individual behavior do not suffice to demonstrate that rational-choice theory cannot be relied upon to anticipate changes in causal structure. Rational-choice theory indeed need not be interpreted as a theory about individual behavior as such, but as a theory of individual behavior in settings in which it is supported by the right institutional scaffolding (compare with Satz and Ferejohn, 1994; Ross, 2014). Although the economics experiments that have attracted the most attention are those that demonstrate the existence of behavioral anomalies, these are not the only kind of experiments economists have been engaged with.

Santos (2007), for example, distinguishes between technological and behavioral experiments. Behavioral experiments are aimed at investigating individual behavior and have often been interpreted as yielding results that are at odds with rational-choice theory. By contrast, technological experiments are aimed at investigating institutional (market) mechanisms. Used as complements to the theoretical models developed in the field of mechanism design, technological experiments have guided many of the successful applications of game theory to the design of real-world markets such as the Federal Communications Commission auctions for the allocation of telecommunication licenses (Roth, 2002). Santos (2007) attributes the success of technological experiments to the robustness of the relation between the designed institution and aggregate outcomes to changes in the environment (most notably, preferences). In other words, the market institution is so designed so as to ensure that the resulting actions are rational and income maximizing.

Moreover, if what we need for mechanism-based extrapolation is information about the causal structure in the source and some relevant information about the

causal structure in the target, there is no need for the mechanism to include individual-level variables – think, for example, of a causal chain between aggregate-level variables. Hoover (2001; 2009) can be interpreted as making a similar point when he argues that Lucas’s critique does not necessarily imply the necessity of individual-level mechanisms. Lucas’s critique holds that in order for estimated relationships to be stable across policy changes, those relationships need to capture the deep parameters in the economy, where deep parameters refer to “the fundamental ontological building blocks of the economy” (Hoover, 2009, p.393). To go from here to the indispensability of individual-level mechanisms requires the further assumption that those parameters are necessarily micro, which is not obvious. As in the previous discussion about causal inference, it is unclear whether reduction, or underlying constitutive structures, is involved in the context of mechanism-based extrapolation. Rather, it seems that the broader notions of mediating variables and causal chains might be sufficient. This is not a critique of Steel’s account of extrapolation – its main insight still stands regardless of the notion of a mechanism sufficient to get it off the ground. At this stage, the relevance of pointing at the possibility that intervening steps need not be at a lower level than the phenomenon to be explained only expands the range of cases in which extrapolation is legitimate.

VII. Concluding remarks

Some of the main debates in the philosophy and methodology of economics are intertwined with one or another use of the notion of mechanism. Specifically, we have examined two such notions: mechanisms as (theoretical hypotheses about) underlying structures and mechanisms as intervening variables. I have shown that at least some economic models aim at capturing mechanisms conceived as abstract descriptions of how social-level phenomena result from the actions and interactions of rational

agents, paralleling the idea of mechanisms as underlying structures. This modeling strategy is closely linked to economists' commitment to methodological individualism, even though on closer inspection mechanistic explanation does not square well with strong versions of methodological individualism, nor are such strong versions apt descriptions of the actual practice of economics. Furthermore, we have seen that although mechanisms are held to aid both causal inference and extrapolation, it is not always clear whether the relevant notion of mechanism at stake is that of mechanisms as underlying causal structures or as intervening variables.

It might then be that the centrality of the notion of mechanism is a product of the flexibility with which the notion itself is used rather than the role it actually plays in economics. If so, the traction of mechanistic ideas would improve by further clarity about what notion is at stake in a particular case. This is not to claim that the focus on mechanism in the philosophy of economics has had no value. On the contrary, reframing, for example, the age-old issue about methodological individualism in terms of mechanistic explanation contributed to make clear that although explaining by mechanisms is valuable, there is no reason to suppose that such mechanisms should be exclusively at the individual level. Similarly, attention to mechanisms has brought to the fore the function that different kinds of evidence have in both causal inference and extrapolation and, hence, the importance of different methods of generating evidence. This is especially topical now that the toolkit of empirical methodologies at the disposal of economists has been expanding.

References

- Bechtel, W & Hamilton, A 2007, 'Reduction, integration, and the unity of science: natural, behavioral, and social sciences and the humanities', in TAF Kuipers (ed.), *General philosophy of science: focal issues*, Elsevier, New York, pp. 377-430.
- Calvó-Armengol, A & Zenou, Y 2003, 'Does crime affect unemployment? The role of social networks', *Annales d'Economie et de Statistique* vol. 71-72, pp. 173-88.
- Cartwright, N 1989, *Nature's capacities and their measurement*, Clarendon Press, Oxford.
- Cartwright, N 2001, 'Ceteris paribus laws and socio-economic machines', in U Mäki (ed.), *The economic world view*, Cambridge University Press, Cambridge, pp. 275-292.
- Claveau, F 2012, 'The Russo-Williamson Theses in the social sciences: Casual inference drawing on two types of evidence', *Studies in History and Philosophy of Biological and Biomedical Sciences* vol. 43, pp. 806-813.
- Coleman, JS 1990, *Foundations of social theory*, Harvard University Press, Cambridge, MA.
- Craver, C 2007, *Explaining the brain*, Oxford University Press, Oxford.
- Donohue, J & Levitt, S 2001, 'The impact of legalized abortion on crime', *Quarterly Journal of Economics*, vol. 116, no. 2, pp. 379-420.
- Elster, J 1983, *Explaining technical change: a case study in the philosophy of science*. Cambridge University Press, Cambridge.
- Garfinkel, A 1981, *Forms of explanation*, Yale University Press, New Haven.
- Glennan, S n.d., *The new mechanical philosophy*, Oxford University Press, Oxford.
- Granovetter, M 1973, 'The strength of weak ties', *American Journal of Sociology* vol. 78, no. 6, pp. 1360-80.

- Guala, F 2010, 'Extrapolation, analogy, and comparative process tracing', *Philosophy of Science* vol. 77, no. 5, pp. 1070-1082.
- Hoover, K 2001, *Causality in macroeconomics*, Cambridge University Press, Cambridge.
- Hoover, K 2009, 'Microfoundations and the ontology of macroeconomics', in H Kincaid & D Ross (eds) *The Oxford handbook of philosophy of economics*, Oxford University Press, New York, pp. 386-409.
- Howick, J 2011, 'Exposing the vanities—and a qualified defense—of mechanistic reasoning in health care decision making', *Philosophy of Science* vol. 78, pp. 926-940.
- Kincaid, H 2004, 'Contextualism, explanation and the social sciences', *Philosophical Explorations*, vol. 7, no. 3, pp. 201-218
- Illari, P & Williamson, J 2012, 'What is a mechanism? Thinking about mechanisms across the sciences', *European Journal for Philosophy of Science*, vol. 2, pp. 119-135.
- Lucas, RE 1976, 'Econometric policy evaluation: a critique', in K Brunner & A Meltzer (eds.) *The Phillips Curve and the Labor Market*, vol. 1, Carnegie-Rochester Conference on Public Policy, Amsterdam, North Holland, pp. 19-46
- Jackson, F & Pettit, P 1992, 'In defense of explanatory ecumenism', *Economics and Philosophy*, vol. 8, 1-21.
- Janssen, M 1993, *Micro-foundations: a critical inquiry*, London and New York, Routledge.
- Kincaid, H 1996, *Philosophical foundations of the social sciences*, Cambridge University Press, New York and Melbourne.

- Kincaid, H. 2004, 'Contextualism, explanation and the social sciences', *Philosophical Explorations*, vol. 7, no. 3, pp. 201-218.
- Kuorikoski, J 2009, 'Two concepts of mechanism: Componential causal system and abstract form of interaction', *International Studies in the Philosophy of Science*, vol. 23, no. 2, 143-160.
- Lawson, T 1997, *Economics and reality*, Routledge Press, London.
- Landsburg, S 1993, *The armchair economist: economics and everyday life*, Free Press New York.
- Mäki, U 1992, 'On the method of isolation in economics', *Poznan Studies in the Philosophy of the Sciences and the Humanities*, vol. 38, pp. 147-168.
- Mäki, U 2002, 'Explanatory ecumenism and economics imperialism', *Economics and Philosophy*, vol. 18, pp. 235-57.
- Mäki, U 2009a, 'Economics imperialism: concept and constraints', *Philosophy of the Social Sciences*, vol. 39, no. 3, pp. 351-380.
- Mäki, U 2009b, 'MISSing the world: models as isolations and credible surrogate systems', *Erkenntnis* vol. 70, no. 1, pp. 29-43.
- Marchionni, C 2008, 'Explanatory pluralism and complementarity. From autonomy to integration', *Philosophy of the Social Sciences*, vol. 38, pp. 314-333.
- Marchionni, C 2013, 'Playing with networks: how economists explain', *European Journal for Philosophy of Science*, vol. 3, no. 3, pp. 331-352.
- Mirowski, P 2007, 'Markets come to bits: Evolution, computation and markomata in economic science', *Journal of Economic Behavior and Organization*, vol. 63, pp. 209-242.

- Northcott, R & Alexandrova, A 2015, 'Prisoner's dilemma doesn't explain much', in M Peterson (ed), *The Prisoner's Dilemma*, Cambridge University Press, Cambridge, pp. 64-84.
- Popper, K 1994, *The myth of the framework*, Routledge, London.
- Reiss, J 2008, *Error in economics*, Routledge, London.
- Reiss, J 2013, *Philosophy of economics. A contemporary introduction*, Routledge, London.
- Rosenbaum, E-F 2000, 'What is a market? On the methodology of a contested concept', *Review of Social Economy*, vol. 58, no. 4, pp. 455-482.
- Ross, D 2014, *Philosophy of economics*, Palgrave Macmillan, New York.
- Roth, A 2002, 'The economist as engineer: game theory, experimentation, and computation as tools for design economics', *Econometrica*, vol. 70, no. 4, pp. 1341-1378
- Russo, F & Williamson, J 2007, 'Interpreting causality in the health sciences', *International Studies in the Philosophy of Science*, vol. 21, no. 2, pp. 157-170.
- Santos, A 2007, 'The 'materials' of experimental economics: technological versus behavioral experiments', *Journal of Economic Methodology*, vol. 14, no. 3, pp. 311-337.
- Satz, D & Ferejhon, J 1994, 'Rational choice and social theory', *Journal of Philosophy*, vol. 91, no. 2, pp. 71-87.
- Staley, K 2004, 'Robust evidence and secure evidence claims', *Philosophy of Science*, vol. 71, no. 4, pp. 467-488.
- Starmer, C 2008, 'Preference reversals', in SN Durlauf & LE Blume (eds.), *The New Palgrave Dictionary of Economics Online*, viewed 06 June 2016, 2nd edn, Palgrave Macmillan.

- Steel, D 2004, 'Social mechanisms and causal inference', *Philosophy of the Social Sciences*, vol. 34, pp. 55-78.
- Steel, D 2008, *Across the boundaries. Extrapolation in biology and the social Sciences*, Oxford University Press, New York.
- Steel, D 2011, 'Causality, causal models, and social mechanisms', in IC Jarvie & J Zamora-Bonilla (eds), *The SAGE handbook of the philosophy of the social sciences*, SAGE Publications, London, pp. 288-304.
- Steel, D 2013, 'Mechanisms and extrapolation in the abortion-crime controversy', in H-K Chao, S-T Chen & R Millstein (eds.), *Mechanisms and causality in biology and economics*, Springer, New York, pp.185-206.
- Udéhn, L 2002, 'The changing face of methodological individualism', *Annual Review of Sociology*, vol. 28, pp. 479-507.
- Ylikoski, P 2012, 'Micro, macro, and mechanisms', in H Kincaid (ed), *The Oxford handbook of philosophy of the social sciences*, Oxford University Press, Oxford, pp. 21-45.

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ⁱⁱ According to some, the assumption that rational agents respond to incentives suffices to characterize the core idea behind economics. Landsburg (1993, p. 3), for example, writes: “Most of economics can be summarized in four words: “People respond to incentives.” The rest is commentary.”

ⁱⁱⁱ Some commentators have claimed that economic model building is in fact at odds with a mechanistic world picture (e.g. Lawson 1997). In rough outline, the criticism is that mainstream economics is committed to a form of deductivism, which presupposes that only events and regularities between them exist, and is unsuitable for the discovery of mechanisms.

^{iv} “The logic of the situation” is part of Popper’s method of situational analysis (1994), according to which explanation in social science proceeds by describing the situation the agent is in. Coupled with the rationality principle, the logic of the situation “explains” the agent’s behavior.

^v Note that in this case the individual-level explanation involves particular individuals rather than types of individuals (Mäki, 2002).

^{vi} Some wonder whether the explanatory strategy exemplified by Coleman’s boat qualifies as a form of methodological individualism in that it allows for the effect of social structure. To distinguish this variety of methodological individualism from its

stronger versions, some refer to it as “structural individualism” (see, for example, Udéhn, 2002).

^{vii} Kincaid’s objection succeeds only if mechanistic ideas are wedded to reductionism.

Recent mechanistic accounts, however, are not reductionistic in this sense. A mechanism is always a mechanism *for* a phenomenon and that sets the boundaries of the relevant mechanism. Whether statistical evidence is sufficient to establish causation however is an object of current philosophical debate (see, for example, Russo and Williamson, 2007; Howick, 2011).

^{viii} Kincaid (2004) distinguishes *horizontal* and *vertical* mechanisms, where the former are intervening variables, whereas the latter are the micro-processes that bring about the macro effect. Yet, an underlying causal structure need not be a micro-process but can also involve social entities and activities that account for the system having a certain property or exhibiting a certain behavior. Similarly, Craver (2007) distinguishes *etiological* and *constitutive* mechanisms. A complete description of an etiological mechanism represents the entities, their activities and form of organization, a requirement that does not apply in the case of mechanisms as intervening variables. A clarification of the relation between these distinct yet similar notions is a topic for further research.

^{ix} Steel (2008) advocates the method of process tracing, which consists in presenting evidence for the existence of several social practices that, when linked together, produce a chain of causation from one variable to another. The relation between process tracing and the type of mechanistic evidence implicated in indirect causal inference is not fully spelled out. However, since I take mechanistic evidence to be the more general category, in this paper I only use this terminology.

^x Rational-choice theory is not the only possible fundamental theory for the social sciences. As I interpret it, however, Steel's point is that current alternatives have not yet reached the status currently enjoyed by rational-choice theory. This does not rule out the possibility that an alternative micro-theory may be developed that perform better in predicting the effects of structure-altering interventions (Steel, 2008, p. 160).

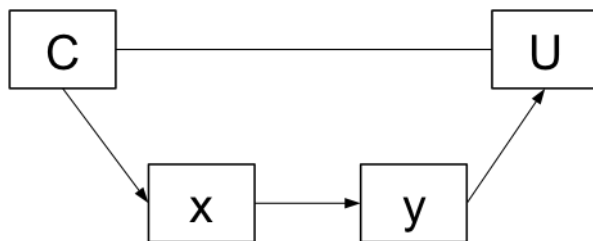


Figure 32.1. Coleman's boat. The mechanism connecting C (crime rate) to U (unemployment level), where x and y represent individual-level variables and the arrows represent causal relations.

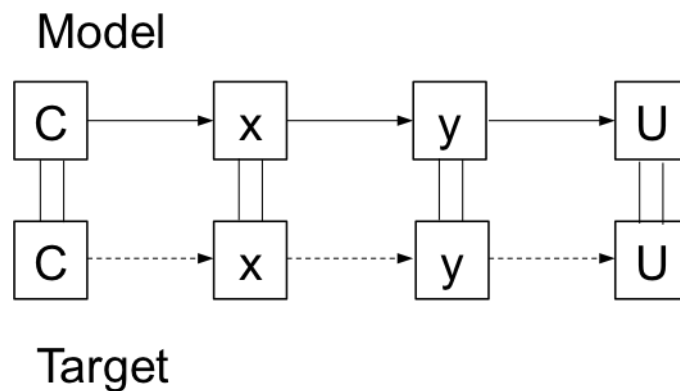


Figure 32.2. Comparative process tracing. Stages of the mechanisms leading from C (crime rate) to U (unemployment) in the model and in the target. The arrows represent causal relations, the dashed arrows represent relations to be inferred about the mechanism in target, and the double lines represent differences and similarities. Adapted from Guala, 2010, p. 1074.